most desirable that all observations regarding snow should be made part and parcel of regular meteorological observations. The Ural Society of Naturalists has already collected valuable materials under that head, and it may be assumed that scientific and practical meteorologists will not be slow in taking advantage of such observations. P. K.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—Mr. S. F. Harmer, B.A., has been appointed Demonstrator of Animal Morphology, in the place of Mr. Walter Heape, resigned. Mr. Harmer was previously Demonstrator of Comparative Anatomy.

The subject for the Sedgwick Prize Essay in 1889 is the Petrology of the Igneous Rocks associated with the Cambrian (Sedgwick) of Carnarvonshire. The essays must be sent in on or before October 1, 1888. It is open only to graduates of Cambridge who have resided sixty days during the year preceding that date.

On the 22nd inst. the General Board of Studies will proceed to nominate a University Lecturer in Geology for five years, in the place of Dr. R. D. Roberts, now Secretary to the London Association for the Extension of University Teaching.

A report of the General Board of Studies has been carried, recommending that no fees shall be paid by students to Professors and Readers in consideration of the lectures which form part of the ordinary duty of their office, but only for further assistance and material or apparatus ; also that a return shall be given to the Board of lectures delivered, extra teaching given, and fees charged.

The important proposals respecting the additional subjects in the Previous Examination required of candidates for honours have been carried in such a way as to make them broader in their effects. The substitution of Mechanics for Statics was carried by 58 to 44. The alternative of French or German was introduced by 59 to 42 ; and then, somewhat surprisingly, the restriction of this alternative to candidates for the Mathematical Tripos, and the requirement that candidates for any other tripos than the Mathematical should pass in the mathematical additional subjects, were rejected by 53 to 49. Thus a great step in advance is made, and any candidate for honours can take Mathematics, French, or German as an additional subject.

Mr. Leslie Stephen has been reappointed an Elector to the Knightbridge Professorship, Lord Rayleigh to that of Chemistry, Mr. Christie, Astronomer-Royal, to the Plumian Professorship ; Dr. Humphry has been appointed an Elector to that of Anatomy in place of the late Dr. Allen Thompson ; Mr. F. Darwin has been reappointed an Elector to that of Botany ; Dr. G. J. Hinde has been appointed an Elector to the Woodwardian Professorship of Geology in place of Rev. E. Hill ; Prof. Stokes, P.R.S., has been reappointed an Elector to the Jacksonian Professorship ; Dr. H. C. Sorby, F.R.S., to that of Mineralogy ; the Right Hon. G. J. Goschen, M.P., has been appointed an Elector of that of Political Economy, in place of Prof. A. Marshall ; Prof. H. N. Moseley, F.R.S., has been reappointed an Elector to that of Zoology and Comparative Anatomy ; Prof. Stokes, P.R.S., to the Cavendish Professorship ; Lord Rayleigh to that of Mechanism ; Dr. F. J. Farre to the Downing Professorship of Medicine ; Prof. Huxley to that of Physiology ; Sir James Paget to that of Pathology ; Prof. William Wallace has been appointed an Elector to that of Mental Philosophy and Logic, in place of Mr. James Ward ; and Mr. Cadge to that of Surgery. The appointments in each case are for eight years.

The report recommending the institution of a Tripos Examination in Engineering, to be combined to some extent with the Natural Sciences Tripos, has been discussed at some length in the Senate. Mr. Hill thought parts of the Mathematical Tripos and the Special Examination of Engineering sufficient. Mr. Trotter throught the proposed examination was required both for engineering students and students of physics. It was desirable to increase the mathematical training of students of engineering. The Mathematical Tripos had, he thought, suffered from its long and illustrious history. The Examiners felt bound to find something new, and a good deal of students' time was spent in recognising old things in disguised forms, and in solving mathematical puzzles, not suitable for an engineering student pressed for time, or for a student of experimental physics. Prof. Stuart said he was in a position to state that the University had now the opportunity of making its engineering certificate very much ahead of anything else in the world. In one very important respect the new examination would differ from the Mathematical Tripos ; it would include practical work in its earliest part.

NEW science buildings are now being erected for Tonbridge School at a cost of nearly 14,000*l*. They will contain chemical and physical laboratories, lecture-room, class-rooms, preparation-rooms, and in addition a library and room for drawing.

SCIENTIFIC SERIALS

The Journal of the Royal Microscopical Society for December 1885 contains :—On some new and rare Desmids, by W. Barwell Turner (plates 15 and 16). Describes a number of new species, for the most part from the United States of America, but the localities are not always very definitely given. A new genus, Leptozosma, is made for a filamentous form near to Bambusina, Kütz, but differing in the sutures. The various forms mentioned are all figured.—Further experiments on feeding insects with the curved or "comma" Bacillus, by Dr. R. L. Maddox. The curved Bacilli are apparently able to retain life in the intestinal tract of flies, and so might possibly become a source of injury to animals.—On the cholera "comma" Bacillus, by G. F. Dowdeswell, M.A.—On an improved form of Stephenson's binocular prisms, by C. D. Ahrens.—Remarks on Prof. Abbe's note on the proper definition of the amplifying power of a lens or lens-system, by Dr. E. Giltay.—On the limits of resolution in the microscope, by Frank Crisp, LL.B., with a note by Prof. Abbe.—The usual summary of current researches and the proceedings of the Society.—At one of the meetings Mr. Crisp exhibited a series of photographic portraits of all the Presidents of the Society. These—eighteen in number—appear in the present part, arranged on two plates of eight portraits each and two full-page portraits of Sir R. Owen, the first President of the Microscopical Society, and of Mr. Glaisher, the first President of the Royal Microscopical Society.

Wiedemann's Annalen, Bd. xxvii. No. 1, January.—F. and W. Kohlrausch, the electro-chemical equivalent of silver, together with an experimental proof of the measurements of intensity of terrestrial magnetism. These determinations, chiefly by the method of Joule, appear to have been made with the utmost regard for precision in all details. The value of the electro-chemical equivalent of silver deduced is about 0·06 per cent. higher than that given by Lord Rayleigh, being 0·0011183 gramme per ampere, as against 0·0011179. Mascart's latest value was 0·0011156. This would make the equivalent of hydrogen 0·000010386.—A. Kundt, on double refraction of light in metal films which are produced by disgregation of a cathode. Films deposited by electric discharges from a pointed cathode show a circularly-arranged dichroism when viewed in the polariscope.—Ch. Lüdeking, on the specific heats, specific gravities, and heats of hydration of the fatty acids and of their mixtures with water.—Otto Schumann, on the density of the adsorbed films of air on surfaces of glass.—J. Lahr, Grassmann's vowel-theory in the light of experiment. Discusses the results obtained by Jenkin and Ewing with a phonograph, and by Schneebeli with a phonautograph.—E. Aulinger, on the relation of Weber's theory of electrodynamics to the principle of unity of electric forces propounded by Hertz.—O. Tumlirz, on the properties of rock crystal in the magnetic field. This paper announces the discovery in this body of residual diamagnetic properties.—Eug. Blasius, notice on Japanese mirrors. Describing kindred phenomena with glass plates which have been scratched at the back with a writing diamond.—E. Lommel, aërostatic balance for the determination of the specific gravities of gases.

Archives Italiennes de Biologie, tome vi. fasc. 3, May 30, 1885.—This part completes volume vi. of this *Archiv*, and in it the editors apologise for its tardy and irregular appearance, which was caused by the terrible epidemic which afflicted Italy in 1884. For the future the *Archiv* will appear not at stated periods, but as matter is ready for publication, every three parts to form a volume. This part contains the last part of a notice of Dr. Beccari's work on "Piante Ospitatrici," by M. E. Levier. These host plants, noticed first by Rumphius in 1750, have been studied in New Guinea and in the Malay Archipelago by Beccari, the first part of whose deeply interesting account of them and their ant guests has but recently been published.—On a case of congenital cataract, by J. Albertotti. The patient was operated on at the age of 21. The operation

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was a brilliant success, and the experiences noted in this paper are of great value; but the result to the patient may be guessed at by his exclamation some months after the operation: "C'était mieux quand je ne voyais pas."—On the action produced on the sensibility and motility of nerves by dilute hydrochloric acid, by Dr. C. Negro.—Note on pneumonococcus, a grave complication in pneumonia, by P. Foa and G. Rattone.—On the physio-pathological aspects of stratified pavement epithelium, and on the pathogeny of albuminuria, by Prof. G. Tizzoni.—On the presence of albumen in saliva, a criticism of the views of Madame Dessales by Prof. Brancaccio, and a reply by Madame Dessales.—On the central termination of the optic nerve in some mammals, by Dr. J. Bellonci.—On the influence of chloral on gastric digestion, by A. Fiumi and A. Favrat.—Anatomical and clinical study of Morgagni's cataract; and on congenital micro-ophthalmy, by Dr. Falchi.

Rivista Scientifico-Industriale, December 15-31.—Dr. Pietro Cardani, variation of the diameter of the sparks with the potential and the resistance: a study of the way the diameter of the sparks is modified by the resistance of the circuit, and how the diameter itself varies with the increase of the explosive distance. The diameter is found to increase proportionately to the square root of the potential, and to decrease according to a hyperbolical function with the increased resistance; hence for great distances this diameter becomes sensibly constant. The same physicist deals with Harris's second law that the explosive distance varies inversely with the pressure of the gas, and concludes that this law is true only within certain limited conditions.—Dante Roster, remarks in connection with Prof. Mariacher's observations on the food of birds. These studies have a practical value, tending to determine those birds which are insectivorous, and consequently harmless, and those that are graminivorous and injurious to the crops.

Reale Istituto Lombardo, January 7.—Summary of Tito Vignoli's monograph on "The Psychic Act of Attention in the Animal Series," in which the author describes the genesis of attention from the lowest to the highest organisms, analysing the elements of sensation and perception, and determining their comparative values. The physiological and psychological conditions of attention are held to be identical in the higher animals and in man, differing only objectively, and man alone being capable of introspective thought. Hence man is distinguished from other animals, not by the physio-psychic act of attention, but by the faculty of submitting his own intelligence to examination.—In a supplementary note on the transition from animal to human intelligence, Vignoli argues that Darwinism will never succeed in explaining the evolution of the organic from the inorganic, nor of sensation and consciousness from the mere organic. The passage from the intelligence of animals to that of man is not a gradual development of the faculties, but is accomplished by a reflex act of animal intelligence on itself. This act must be instantaneous, consequently is not the result of evolution, as are the physical conditions leading up to it.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, January 7.—"Experimental Researches on the Propagation of Heat by Conduction in Muscle, Liver, Kidney, Bone, and Brain." By J. S. Lombard, M.D., formerly Assistant Professor of Physiology in Harvard University. Communicated by Charles E. Brown-Séquard, M.D., LL.D., F.R.S.

January 14.—"Notes upon the Straining of Ships caused by Rolling." By Prof. Francis Elgar, LL.D., F.R.S.E.

It does not appear that any serious attempt has yet been made to investigate the amounts, or even the nature, of the principal straining actions which the rolling of a ship brings into play, or of the effect of those straining actions upon the material of which the hull is composed. Various writers, from Bouguer in 1746, down to Prof. Macquorne Rankine in 1866, and Sir E. J. Reed in 1871, have discussed the straining actions that are caused by longitudinal racking and bending when a vessel is floating in statical equilibrium. Sir E. J. Reed elaborately investigated the subject in a paper contained in the *Philosophical Transactions* of the Royal Society for 1871, and gave examples of the amounts and distribution of the stresses caused by such straining actions in several typical ships of Her Majesty's Navy. Mr. W. John supplemented this by a paper on the strength of iron ships, read before the Institution of Naval Architects in 1874, in which similar results were given for various classes of vessels in the mercantile marine.

The later investigations of these longitudinal straining actions apply not only to the case of a ship floating in equilibrium in still water, but also to cases in which she is (1) in instantaneous statical equilibrium across the crest of a wave; and (2) in instantaneous statical equilibrium across the hollow of a wave—the wave-length being equal to the length of the ship.

Cases frequently occur which show that the maximum stresses of the material of a ship's hull are not in proportion to the results obtained by the ordinary calculations; and that certain deductions that have been drawn from those results are by no means sound. For instance, it is said to follow from the analogy between the longitudinal bending action upon a ship afloat and that upon a loaded girder, that there is little or no stress exerted upon that portion of a ship's plating which is in the vicinity of the neutral axis for the upright position; and the inference has been drawn that, subject to the consideration of the sides being occasionally brought, in some degree, into the positions of flanges of a girder at large inclinations, the thickness of the material may be decreased with advantage near the neutral axis. Now it cannot be shown that the plating which is in the vicinity of the neutral axis when the ship is upright, is ever brought into such a position by the rolling of a vessel as to be much affected by mere longitudinal bending.

Other propositions respecting the distribution of stress in various parts of the structure have been deduced from considerations and assumptions upon which the ordinary calculations of longitudinal strength are based; and rules have, in consequence, been proposed for regulating the strength of the principal component parts of ships' hulls. It is only necessary here to say that many of those deductions, like the one already noticed, are unsound, and are not consistent with the effects that may be observed of straining action at sea.

A considerable experience at sea, where the author has closely observed the effects of straining action caused by twisting moments, and a further experience in investigating the stresses to which the various portions of ships' hulls are subjected according to the theories referred to, and in comparing the results so obtained with the visible evidences of straining action, have convinced him that the stresses caused by twisting moments are much greater than is generally supposed, and that no rules for regulating the strength of ships can be satisfactory if based upon hypotheses that exclude all practical consideration of twisting moments.

The straining action considered in this paper is that caused by the twisting moments which operate when a ship rolls from side to side, and which are caused by differences in the longitudinal distribution of the moments of the forces that cause rotation, and those which resist rotation.

After describing at length the manner in which the twisting moments may be approximately calculated, the author proceeds to consider the amounts and distribution of the stresses upon the material of the hull which are caused by a given twisting moment:—

We can learn something of the nature and distribution of those stresses; but, at present, their amounts cannot be calculated with any reliable approach to accuracy. Experiments are required upon the torsion of thin shells of various prismatic forms in order to furnish the requisite data for dealing with so complicated a case as that of a ship's hull. The difficulty of obtaining exact data is very great; but attention is drawn to some of the general considerations which affect the twisting moments and the distribution of the twisting strains and stresses over a ship's hull; and to the bearing which these have upon the important practical problems that relate to the structural strength of ships.

The best data available for guidance in judging of the distribution of strain and stress due to twisting over the structure of a ship are to be found in M. de Saint-Venant's investigations of the torsion of prisms.[1]

The distribution of the torsional stresses over the transverse section of a ship's hull is obviously different from the distribution

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[1] "Mémoires présentés par divers Savants à l'Académie des Sciences de l'Institut Impérial de France," tome 14, 1856. "Mémoire sur la Torsion de Prismes, &c." Par M. de Saint-Venant," pp. 233-560. Also Thomson and Tait's "Natural Philosophy," vol. i., part 2, secs. 699-710.

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